COMPARATIVE EVALUATION OF VISUAL AND COLORIMETRIC METHODS OF TEETH COLOR DETERMINATION

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ABSTRACT

Tooth colour determination is an significant part in the prosthetic dentistry during production of tooth-coloured restorations. Visual and colorimetric methods are most commonly used in dental practice. The aim of the present study was to compare both methods for determining the color of teeth. For optimum esthetic result of restoration of teeth application of the combined method of color teeth determination (visual and colorimetric) taking into account such indicators of the spectrophotometer as ΔL (lightness) and ΔC (saturation) are recommended.

Key words: methods of determination of color of teeth, spectrophotometer, esthetic restorations, visual perception

http://www.iaeme.com/IJMET/issues.asp?JType=IJMET&VType=10&IType=4
Comparative Evaluation of Visual and Colorimetric Methods of Teeth Color Determination

1. INTRODUCTION
The teeth color is determined by the dentin, with translucent enamel, which is playing a lesser role through scattering at wavelengths in the blue range [8]. It is very important to determine the color of the teeth correctly, as this affects the success of the restoration in the future. Visual and colorimetric – methods for determining the color of teeth. The color tabs used for color determination in the dental clinics covers most frequent tooth shades occurring in nature and is designed to provide systematic coverage of the tooth color spectrum. Some systems are using color classification with values of lightness, color saturation described as chroma and hue referring to the property by which the dominant wavelength is expressed [2]. The advantage of electronic devices is to eliminate the subjectivity, but visual perception has individual characteristics. The aim of the present study was to compare both methods for determining the color of teeth and advise the patient on their using.

2. MATERIALS AND METHODS
This work was done at Sechenov University with supported by the “Russian Academic Excellence Project 5-100”.

220 patients, who had defects of teeth crowns according to the index of destruction of the occlusal tooth surface more than 0.55, were examined and divided into 4 groups of 55 patients in each group [1]. A dental technician and a doctor determine the color of teeth by a visual method in patients of the first group. The second group - the doctor determines the color of the teeth by colorimetric and visual methods, then the dental technician uses the visual method. The third group – both the doctor and the dental technician use visual and colorimetric methods. Fourth – the doctor determines the color of the teeth only by the colorimetric method, the dental technician – the visual method [5, 6].

Using the VITAPAN Classical color scale, teeth color is determined by visual method, and using the VITA EasyShade spectrophotometer (VITA Zahnfabrik, Germany) under standard illumination conditions (color rendering index CRI (Color Rendering Index) 95 and illumination 1000 Lux) by colorimetric method [3].

Indicators of tooth color and restoration ΔЕ, ΔL, ΔС, ΔН, where ΔE is the difference between the two shades of the scale, ΔC – the difference of saturation between the reference and restoration, ΔL – the difference in brightness (lightness) between the reference and restoration, ΔН – the color tone difference between the reference and restoration was determined by the VITA EasyShade spectrophotometer (VITA Zahnfabrik, Germany) [4]. Work marks: “***” is perfect, “**” is good and “*”satisfactory showed by spectrophotometer. Under standard illumination conditions, the physician, dental technician and patient visually defined the quality criteria of the restoration as “perfect”, “good” and “satisfactory” [7, 9, 10]. The difference is not visible in the “ideal” assessment between the color of the teeth in the patient's mouth and the color of the restoration. The difference between the color of the restoration and the color of the teeth in the patient's oral cavity, which is visible to the doctor, was assessed as “good”. The difference between the color of the dentition in the patient's mouth and the color of the performed restoration was noticeable by the patient and the doctor when assessing “satisfactory” [11, 12].

3. RESULT AND DISCUSSION
In the analysis of the obtained results (figure 1) it was found that the number of perfectly performed restorations in patients of the first group was 51% (ΔL – lightness, ΔС –saturation - spectrophotometer values are close to 0). 47% of the restorations in this group were rated “good” (ΔL – lightness, ΔС –saturation close to -1). Only 2% of the performed restorations (ΔL – lightness, ΔС –saturation close to -3) were assessed as “satisfactory”.

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The number of perfectly executed works in the second group increased to 58%. At the same time, ΔL (lightness) is close to the value of 1, ΔC (saturation) is close to the value of 0.5. The number of restorations with a rating of “good” amounted to 42%, the values of ΔL (lightness) of 0.9, ΔC (saturation) of 0.3. And the number of satisfactorily performed works decreased to 0.

As a result of the application of colorimetric method to determine the color of teeth and visual method, both in the clinic and dental laboratory, the outcome with the assessment of “perfect” reached 85%, and 15% percent contained work with the “good” assessment. There weren’t works with an assessment of “satisfactory” in this group. However, the index ΔL (lightness) varied from 0 to -1, ΔC (saturation) - from 0 to 1, respectively, from “perfect” to “good” performed work.

The percentage of “perfect” work performed of patients in the fourth group decreased to 35%, the values of ΔL (lightness) and ΔC (saturation) were 0. There were 55% works with a rating of “good” and “satisfactory” - 10%. Indicators ΔL (lightness) and ΔC (saturation) increased from 0 to -2, respectively, from “good” to “satisfactory” of work performed.

![Figure 1. Assessment of restoration by groups.](image)

**4. CONCLUSIONS**

Thus, in the course of the study we found that the best aesthetic result of the restoration we extract when using the visual and colorimetric method, as a dentist and dental technician. However, from a practical point of view, indirect restoration takes three times longer than usual. The best is the use of a combined method for determining the color of the teeth by a dentist (visual and colorimetric). When using the combined method of determining the color of the teeth and choosing the color of the restoration standard, it is necessary to analyze the changes in the spectrophotometer ΔL (lightness) and ΔC (saturation).

**REFERENCES**


